3101P-UM-052

LINEARCORDER

PLUG-IN UNITS

General Description

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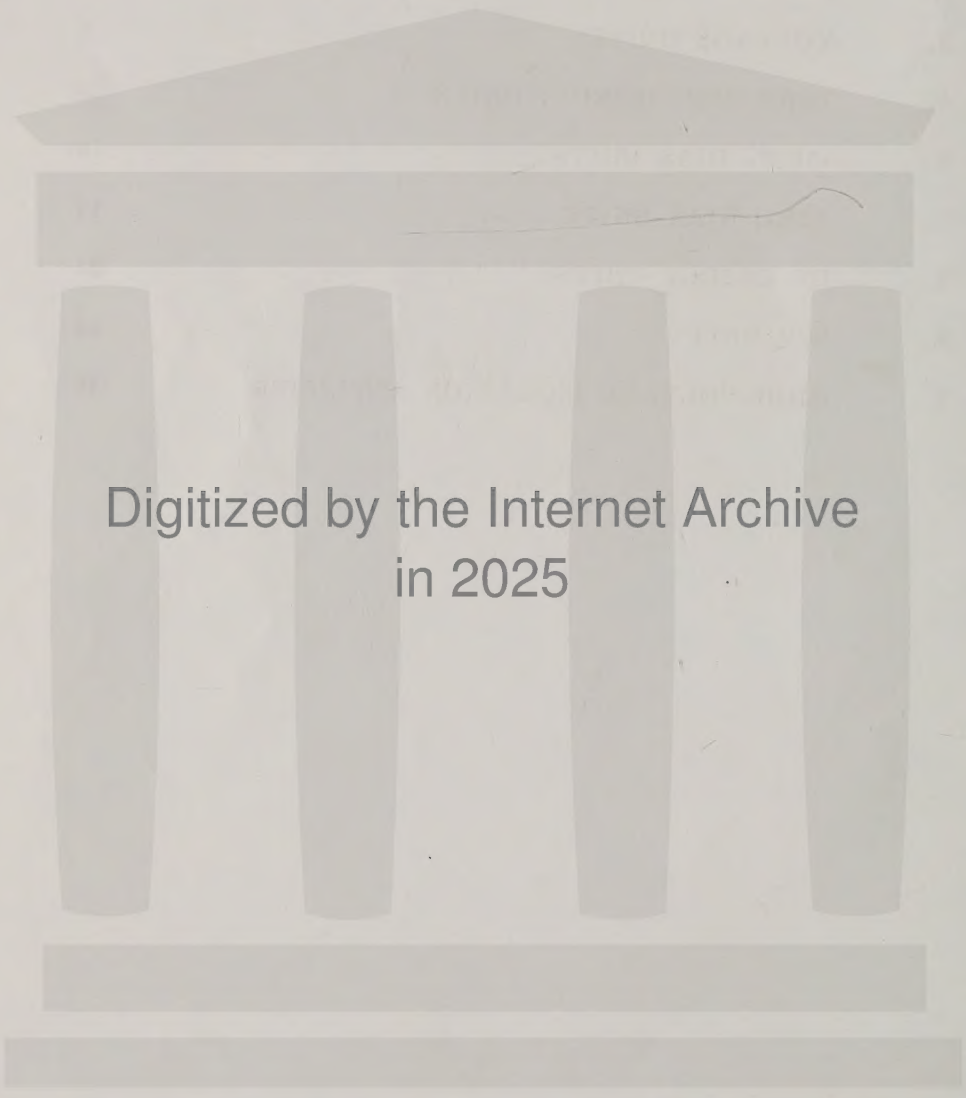

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1. INTRODUCTION

A new line of plug-in units has been developed to ensure the most effective use of Linearcorders and bring the recording process closer to the phenomena being measured.

In addition to voltage signal input units, this newly developed line of plug-in units includes DC bridge amplifiers designed for convenient use in strain and stress measurements, suppression amplifiers enabling expanded recording, bias-type amplifiers up to 1000% and an F-V conversion amplifier for use in frequency, rpm and vibration measurement applications. All these versatile plug-ins are contained in a single case and are connectable to various transducers to enable compensation and conversion to an electrical signal usable for recording. The compatible plug-in configuration greatly simplifies the task of customizing the Linearcorder for particular recording applications.

2. PLUG-IN UNIT TYPES

	Model		Description	Application
Voltage units	Standard sensitivity	AL3101	Maximum sensitivity 5mV/cm	DC voltage measurement
	"	AL3102	" " 2.5mV/cm	
	"	AL3501	" " 20mV/fs	
	High sensitivity	AH3101	" " 1mV/cm	
	"	AH3102	" " 0.5mV/cm	
	"	AH3501	" " 5mV/fs	
	Suppression	KZ3101	Maximum sensitivity 10mV/cm Suppression voltage 0 to ±19.99V	
	"	KZ3102	Maximum sensitivity 5mV/cm Suppression voltage 0 to ±19.99V	
	"	KZ3501	Maximum sensitivity 50mV/fs Suppression voltage 0 to ±19.99V	
	Bias	ALZ3101	Maximum sensitivity 5mV/cm Bias ±1000%	
	"	ALZ3102	Maximum sensitivity 2.5mV/cm Bias ±1000%	
	"	ALZ3501	Maximum sensitivity 20mV/fs Bias ±1000%	
		AZ3101	Maximum sensitivity 1mV/fs Bias ±300%	
	"	AZ3102	Maximum sensitivity 1mV/fs Bias ±300%	
	DC Bridge	KB3101	Maximum sensitivity 0.5mV/cm	Strain measurement
	"	KB3102	" " 0.25mV/cm	
	"	KB3501	" " 2.5mV/fs	
	F-V	KF3101	20Hz to 10kHz	Frequency measurement

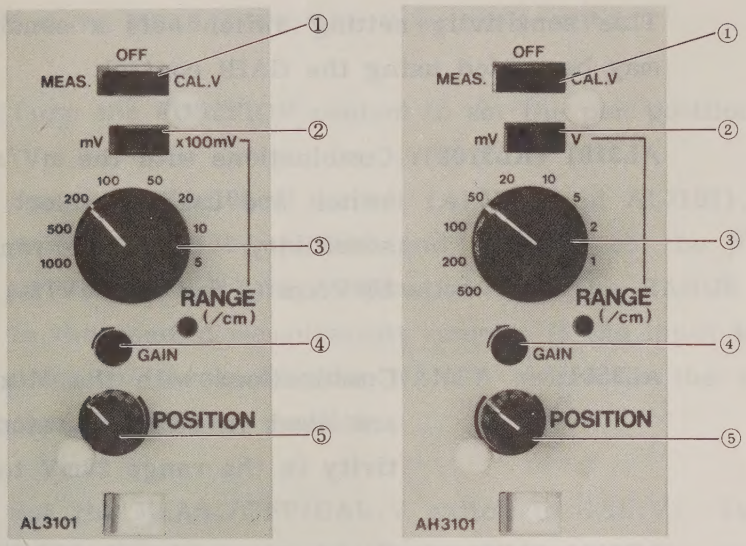
3. VOLTAGE UNITS

3.1 Introduction

For extremely low-level input signals, it is not possible to deflect the pen sufficiently. To overcome this problem, the voltage units amplify the input signal and provide ample deflection for proper recording. Six types, with differing voltage sensitivities and recording amplitudes, are available- AL3101, AL3102, AH3101, AH3102, AL3501 and AH3501.

Item \ Model	AL3101	AL3102	AH3101	AH3102	AL3501	AH3501
Input type	Floating ground with guard					
Maximum sensitivity	5mV/cm	2.5mV/cm	1mV/cm	0.5mV/cm	20mV/fs	5mV/fs
Measurement ranges (and switching accuracy)	5, 10, 20, 50, 100, 200, 500, 1000mV 0.5, 1, 2, 5, 10, 20, 50, 100V/cm	2.5, 5, 10, 25, 50, 100, 250, 500mV 0.25, 0.5, 1, 2.5, 5, 10, 25, 50V/cm	1, 2, 5, 10, 20, 50, 100, 200, 500mV 1, 2, 5, 10, 20, 50, 100, 200, 500V/cm	0.5, 1, 2.5, 5, 10, 25, 50, 100, 250mV 0.5, 1, 2.5, 5, 10, 25, 50, 100, 250V/cm	20, 50, 100, 200, 500mV 1, 2, 5, 10, 20, 50, 100, 200V/fs	5, 10, 20, 50, 100, 500mV 1, 2, 5, 10, 20, 50, 100, 200V/fs
	±1% (with respect to 500mV/cm range)	±1% (with respect to 250mV/cm range)	±1% (with respect to 500mV/cm range)	±1% (with respect to 250mV/cm range)	±1% (with respect to 1V/fs range)	±1% (with respect to 1V/fs range)
Input resistance	1M Ω (fixed)					
Sensitivity adjustment	Continuous adjustment between ranges					
Calibration voltage	Measurement range x2 (20mm)	Measurement range x4 (40mm)	Measurement range x2 (20mm)	Measurement range x4 (40mm)	Voltage corresponding to 1/2 of full scale switched with input.	
Zero setting	Settable at any position with respect to full					
Input filter			Built-in (-20dB/-40dB/OFF, switchable)			
CMRR	DC: 130dB, AC: 110dB		DC: 140dB, AC: 120dB		DC: 130dB AC: 110dB	DC: 140dB AC: 120dB
Maximum allowable input voltage	500V DC (including common-mode voltage)					

3.3 Panel Description and Operation



1 MEAS./OFF/CAL.V

When this input switch is set to MEAS., the input signal is applied, and when set to OFF, the input signal is separated from the input and the input of the unit grounded. In the CAL.V position a calibration voltage equal to 2 times (AL3101 and AH3101) or 4 times (AL3102 and AH3102) the measurement range is applied internally.

2 mV/x100mV (AL3101, AL3102)
V/x100V (AL3501)
This switch allows selection of 1 or 1/100 as the multiplier for the range selected by the RANGE switch.

2 ' mV/V (AH3101, AH3102 and AH3501)

This switch is used to select the units for the range, and is used in combination with the RANGE switch in determining the overall measurement range.

3 RANGE

This sensitivity setting switch sets a sensitivity which may be varied using the GAIN control.

AL3101 (AL3102): Combinations with the mV/x100mV switch are used to select 16 steps of sensitivity in the range 5mV to 100V/cm (2.5mV to 50V/fs).

AL3501: Combinations with the V/x100V switch are used to select 16 steps of sensitivity in the range 20mV to 200V/fs

AH3101 (AH3102): Combinations with the mV/V switch are used to select 18 steps of sensitivity in the range 1mV to 500V/cm (0.5mV to 250V/cm).

AH3501: Combinations with the mV/V switch are used to select 18 steps of sensitivity in the range 5mV to 200V/fs.

4 GAIN

Turning this continuous sensitivity control fully clockwise results in the sensitivity indicated by the RANGE switch position being set. The sensitivity is decreased by turning this control in the counterclockwise direction.

5 POSITION

This control is used to adjust the pen zero point.

This zero point adjustment is made with the MEAS./OFF/CAL.V switch in the OFF position.

3.3.1 Operation

(1) Set the MEAS./OFF/CAL.V switch to OFF.

(2) Turn the POSITION control to set the pen position.

(3) Set the mV/x100mV switch (AL3101 and AL3102), mV/V switch (AH3101, AH3102 and AH3501) or the V/x100V switch (AL3501) in combination with the RANGE switch to the desired measurement range. If the input is of an unknown level, set the RANGE switch to the extreme counterclockwise position.

(4) Set the MEAS./OFF/CAL.V switch to CAL.V. Turn the GAIN control counterclockwise to decrease the amplitude and clockwise to increase the amplitude.

(5) Set the MEAS./OFF/CAL.V switch to MEAS. to begin measurements. If the input is of an unknown level, turn the RANGE switch in the clockwise direction from the extreme counterclockwise direction to set the measurement range.

3.3.2 Using the GAIN Sensitivity Adjustment

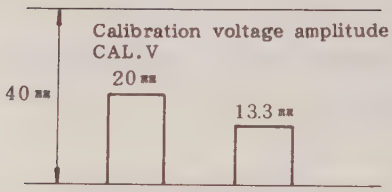
o Setting a Sensitivity Not Marked on the RANGE (/cm indicator amplifier)

Assume that you wish to set a full scale of 40mm to correspond to an input of 3V.

(1) Use the RANGE switch to select 500mV/cm sensitivity.

(2) With the MEAS./OFF/CAL.V switch set to CAL.V, turn the GAIN control so that the pen deflection is 13.3mm. The governing equation is as follows.

$$\text{Full scale voltage} = \frac{\text{Range value} \times 2 \times 40\text{mm}}{\text{Deflection in CAL.V position}}$$



o A calibration voltage equal to 2 times the input sensitivity is applied. Since the input sensitivity is 500mV, the calibration voltage is 1V.

If the deflection with the calibration voltage applied is adjusted to 13.3mm, the full scale (40mm) will be 3V.

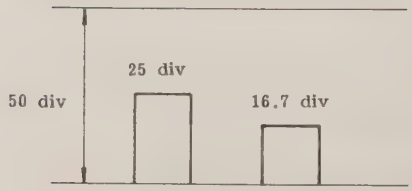
o Setting a Sensitivity Not Indicated on the RANGE Switch (/fs indication amplifier)

If, for example, a 3V signal is to cause a deflection of 50div, perform the following.

(1) Use the RANGE switch to select 2V sensitivity.

(2) With the MEAS./OFF/CAL.V switch set to CAL.V, turn the GAIN control so that the pen deflection is 16.7div. The governing equation is as follows.

$$\text{Full scale voltage} = \frac{\text{Range value} \times 25\text{div}}{\text{Deflection of CAL.V position}}$$

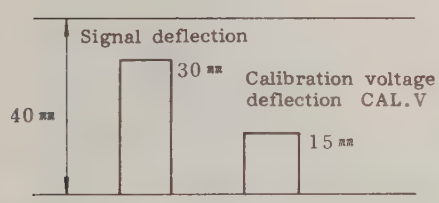


* A calibration voltage of one-half the input sensitivity is applied. Since the input sensitivity is 2V/fs, the calibration voltage is 1V.

If the deflection with the calibration voltage applied is adjusted to 16.7div, the full scale (50div) will be 3V.

o Measuring a Signal of an Unknown Level

Assume a deflection of 30mm by the input signal and a RANGE switch setting of 1V.



o The calibration voltage applied will be 2V (i.e., 2 times the input sensitivity).

Since the signal deflection is twice that caused by the calibration signal, the signal level is 4V.

The governing equation is as follows.

$$\text{Signal level} = \text{RANGE value} \times 2 \times \frac{\text{Signal deflection (div)}}{\text{CAL.V Deflection}}$$

o When measuring a signal it is necessary to switch the MEAS./OFF/CAL.V switch to CAL.V and record the pen deflection before, during and after the measurement.

It is also necessary to record the setting of the RANGE switch as well as that of the mV/x100mV (AL3101 and AL3102) or mV/V (AH3101 and AH3102) switch. The above equation enables the amplitude (voltage) at any point on the recorded waveform to be calculated.

o The above example referred to the AL3101 or AH3101. For the AL3102 or AH3102, the calculation should be made for a full scale of 80mm and a calibration voltage of 4 times the input sensitivity.

4. ZERO SUPPRESSION UNITS

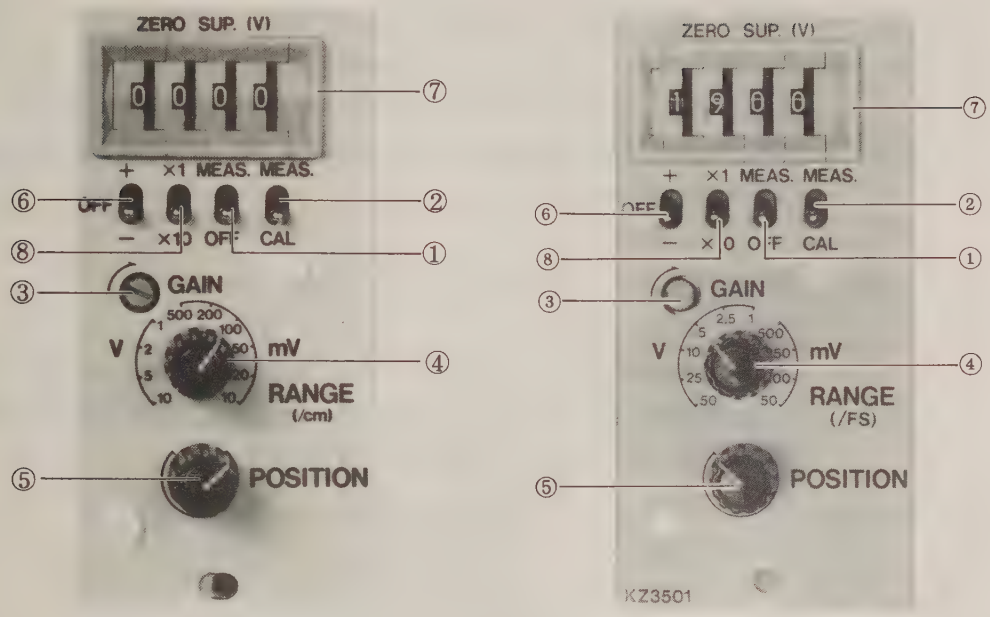
4.1 Introduction

These units are used when measuring signals that are too low in level to provide an adequate pen deflection or signals which have a superimposed DC bias, cancelling out the bias and enabling magnified recording of only the varying component of the input signal. The suppression voltage range is 0 ∿ ±19.99V.

4.2 Specifications

Model	KZ3101	KZ3102
Input type	Floating ground with guard	
Maximum sensitivity	10mV/cm	5mV/cm
Measurement range	10,20,50,100, 200,500mV/cm 1,2,5,10V/cm	5,10,20,50,100, 250mV/cm 0.5,1,2.5,5V/cm
Input resistance	100kΩ (fixed)	
Accuracy	±1% of full scale (including linearity and deadband)	
Sensitivity adjustment	Continuous adjustment between ranges	
Calibration voltage	Switchable voltage 2 times measurement range	Switchable voltage 4 times measurement range
Zero setting	Settable at any position with respect to full scale	
Frequency response	DC ∿ 300Hz (-3dB point of amplifier alone)	
Suppression voltage	x10 Range: 0∿+19.99V x1 Range: 0∿±1.999V (Accuracy: ±0.5 full scale)	
CMRR	130dB (DC), 80dB (50/60Hz)	
Maximum allowable input	120V DC	
Stability	10μV/°C (typical)	

4.3 Panel Description and Operation



1 MEAS./OFF

When this input switch is set to MEAS., the input signal is applied, and when set to OFF, the input signal is separated from the input and the input of the unit grounded.

2 MEAS./CAL

This switch is set to MEAS. during measurements. When set to CAL, a calibration voltage of 2 times (KZ3101) or 4 times (KZ3102) the measurement range is applied to the input internally.

3 GAIN

This continuous sensitivity control, when turned fully clockwise, results in the sensitivity indicated by the RANGE switch position being set. The sensitivity is decreased by turning this control in the counterclockwise direction.

4 RANGE

This sensitivity selection switch enables the selection of sensitivity in 10 steps in the range 10mV to 10V/cm (KZ3101) or 50mV to 50V/fs (KZ3501).

5 POSITION

This control is used to adjust the pen zero point.

This zero point adjustment is made with the MEAS./OFF switch in the off position and the MEAS./CAL switch in the MEAS. position.

6 +/OFF/-

This switch enables the suppression voltage to be turned ON and OFF as well as enabling the selection of suppression voltage polarity.

With the switch at the + or - settings, a voltage equal to the voltage set by the ZERO SUP. and x1/x10 switch is superimposed on the input signal with a positive or negative polarity, respectively.

7 ZERO SUP. (V)

This set of digital switches is used in combination with the x1/x10 switch to set the suppression voltage. The units are volts.

8 x1/x10

This switch is used to select the multiplier of suppression voltage set on the ZERO SUP. digital switches to x1 or x10.

4.3.1 Operation

(1) Set the MEAS./OFF switch to OFF and the MEAS./CAL to MEAS.

(2) Turn the POSITION control to set the pen position.

(3) Set the RANGE switch to the desired measurement range.

(4) Set the MEAS./CAL switch to CAL. Turn the GAIN control counterclockwise to decrease the amplitude and clockwise to increase the amplitude. With the GAIN control in the extreme clockwise position, the sensitivity is the setting of the RANGE switch.

(5) Return the MEAS./CAL switch the the MEAS. position.

(6) Set the suppression voltage using the combination of the -/OFF/+, ZERO SUP. and x1/x10 switches.

(7) Set the MEAS./OFF switch to MEAS. to begin measurements. If the input is of an unknown level, turn the RANGE switch in the clockwise direction from the extreme counterclockwise position to set the measurement range.

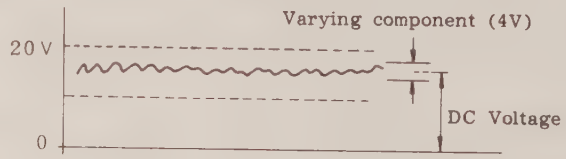
4.3.2 Setting the Suppression Voltage

When using the AL or AH voltage unit, the POSITION control is turned to adjust the pen position to up to almost 110% of full scale.

With the KZ units, however, by applying a suppression voltage, it is possible to perform measurements over the range ±(1V x 4) ±19.99V in the 1V/cm sensitivity range.

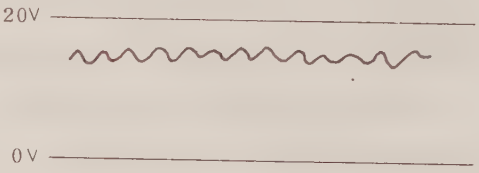
Assume, for example, that the following signal were to be input and recorded.

Input waveform



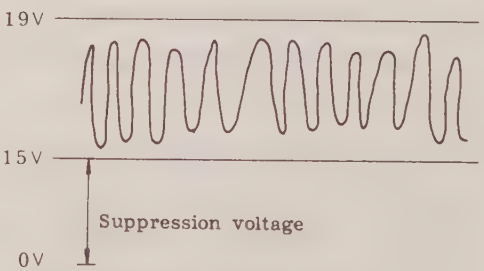
If an AH or AL unit is used, an input sensitivity setting of 5V would result in the following recording.

RANGE 5V/cm



However, with the KZ unit, the recording would appear as follows.

RANGE 1V/cm



If the input sensitivity is set to 1V/cm, too large an input will cause the pen to deflect full scale at the right edge. To avoid this, a suppression voltage is applied to cancel out the DC voltage superimposed on the input waveform, thus enabling magnified recording of only the desired waveform.

5. ±1000% BIAS UNITS

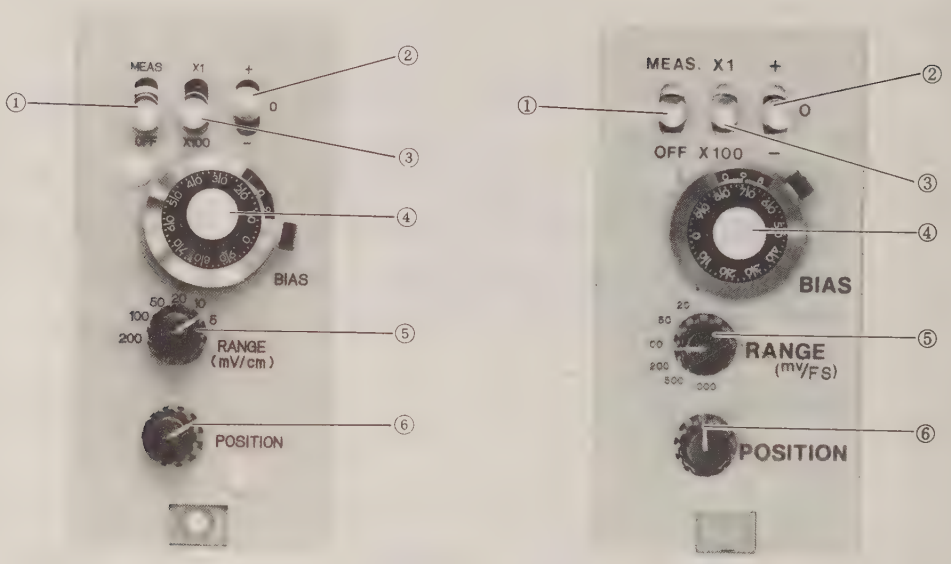
5.1 Introduction

These units are used when measuring signals that are too low in level to provide an adequate pen deflection or signals which have a superimposed DC bias, cancelling out the bias and enabling magnified recording of only the varying component of the input signal. A bias of from -1000% to +1000% of full scale may be applied.

5.2 Specifications

Model	ALZ3101	ALZ3102
Input type	Floating ground with guard	
Maximum sensitivity	5mV/cm	2.5mV/cm
Measurement range	5,10,20,50,100, 200mV/cm 0.5,1,2,5, 10,20V/cm	2.5,5,10,25,50, 100mV/cm 0.25,0.5,1,2.5 5,10V/cm
Input resistance	1MΩ (fixed)	
Maximum signal source resistance	1kΩ	
Zero setting	Settable up to 130% of full scale	
Bias voltage	±1000% of full scale, continuously adjustable using a 10-turn potentiometer provided with a lockable multi-turn indicator.	
Bias voltage setting accuracy	1% for a bias setting of 1000%	

5.3 Panel Description and Operation



1 MEAS./OFF

When this input switch is set to MEAS., the input signal is applied, and when set to OFF, the input signal is separated from the input and the input of the unit grounded.

2 -/0/+

This switch enables the bias voltage to be turned ON and OFF as well as enabling the selection of bias voltage polarity.

With the switch at the + and - settings, a voltage equal to the voltage set by the BIAS control and x1/x10 switch is superimposed on the input signal with a positive or negative polarity, respectively.

3 x1/x100

This switch is used to select the multiplier of bias voltage set by the BIAS control to x1 or x100.

4 BIAS Adjustment

This dual coaxial control is used to set a two-digit value which is used in combination with the setting of the x1/x100 switch to determine the value of bias. The units are % with respect to full scale.

5 RANGE

This sensitivity selection switch enables 12 steps of sensitivity to be selected in the range 5mV to 20V/cm (ALZ3101) or 20mV to 100V/fs (ALZ3501).

6 POSITION

This control is used to adjust the pen zero point.

This zero point adjustment is made with the MEAS./OFF switch in the OFF position.

(Operation)

(1) Set the MEAS./OFF switch to OFF and the -/0/+ switch to 0.

(2) Turn the POSITION control to set the pen position.

(3) Set the RANGE switch to the desired measurement range.

(4) Turn the BIAS control and set the x1/x100 switch to select value of bias in units of % of full scale in the range -1000% to +1000%.

(5) Set the MEAS./OFF switch to MEAS. to begin measurements. Apply a bias of the desired polarity by setting the -/0/+ switch to either - or +.

If the input is of an unknown level, turn the RANGE switch in the clockwise direction from the extreme counterclockwise position to set the measurement range.

6. ZERO BIAS UNITS

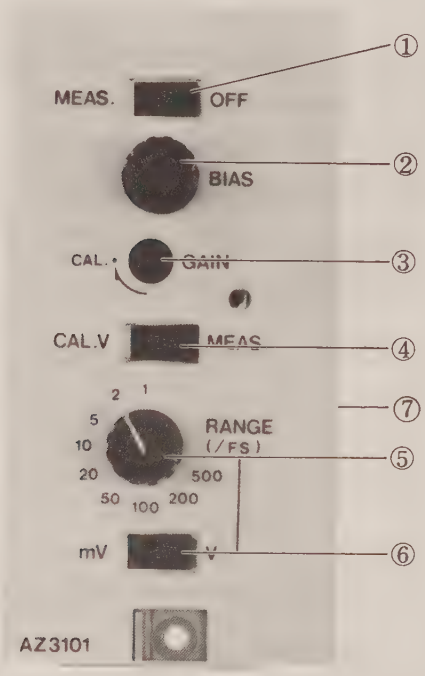
6.1 Introduction

These units are used when measuring signals that are too low in level to provide adequate pen deflection or signals which have a superimposed DC bias, cancelling out the bias and enabling magnified recording of only the varying component of the input signal. A bias of from -300% to +300% of full scale may be applied.

6.2 Specifications

Model	AZ3101	AZ3102
Input type	Floating ground with guard	
Maximum sensitivity	1mV/full scale	
Measurement range	1, 2, 5, 10, 20, 50, 100, 200, 500mV & V/FS	0.5, 1, 2.5, 5, 10, 25, 50, 100, 250mV & V/FS
Accuracy	±0.5% of full scale (including linearity and deadband)	
Input resistance	10MΩ (mV ranges), 20MΩ (V ranges)	
Maximum signal source resistance	10kΩ	
Sensitivity adjustment	Continuous adjustment between measurement ranges.	
Calibration voltage	2 times the measurement range (20mm)	4 times the measurement range (40mm)
Zero setting	Continuously adjustable in the range -300 to +300% of full scale, with manually applied bias.	
Input filter	Switchable: OFF, -20dB, -40dB	
CMRR	DC: 150dB, AC: 130dB (50/60Hz)	
Maximum allowable input voltage	500V DC (including common-mode voltage)	
Stability	0.7μV/°C (Amplifier alone)	

6.3 Panel Description and Operation



1 MEAS./OFF

When this input switch is set to MEAS., the input signal is applied, and when set to OFF, the input signal is separated from the input and the input of the unit grounded.

2 BIAS

This control adjusts the amount of bias applied to the input signal.

Continuous adjustment in the range -300% to +300% of full scale is possible.

3 GAIN

This continuous sensitivity control, when turned fully clockwise, results in the sensitivity indicated by the RANGE switch position being set. The sensitivity is decreased by turning this control in the counterclockwise direction.

4 CAL.V/MEAS.

This switch is set to MEAS. during measurements. When set to CAL.V, a calibration voltage of 1/2 of the full scale is internally applied.

5 RANGE

This sensitivity selection switch is used in combination with the mV/V switch to enable selection of sensitivity in 18 steps in the range 1mV to 500V/FS. The set sensitivity may be changed by using the GAIN control.

6 mV/V

This switch is used to select the units for the range and is used in combination with the RANGE switch in determining the overall measurement range.

7 OFF/-20dB/-40dB

This is the input filter switch. To use the input filter, set the switch to -20dB or -40dB.

(Operation)

(1) Set the MEAS./OFF switch to OFF and the CAL.V/MEAS. switch to MEAS.

(2) Turn the BIAS control to set the bias in the range -300 to +300% of full scale.

(3) Set the RANGE switch in combination with the mV/V switch to the desired measurement range.

(4) Set the CAL.V/MEAS. switch to CAL.V and turn the GAIN control to adjust the pen amplitude. Turn the GAIN control counterclockwise to decrease the amplitude and clockwise to increase the amplitude. With the GAIN control in the extreme clockwise position, the sensitivity is the setting of the RANGE switch.

(5) Return the CAL.V/MEAS. switch to the MEAS. position and the MEAS./OFF switch to the MEAS. position to start measurements.

If the input is of an unknown level, turn the RANGE switch in the clockwise direction from the extreme counterclockwise direction to set the measurement range. To use the input filter, set the OFF/-20dB/-40dB switch to either -20dB or -40dB.

7. DC BRIDGE UNITS

7.1 Introduction

These units are used in conjunction with strain gauges to enable measurement of strain and stress of materials, machinery and structures.

The input section consists of a strain gauge DC bridge, and an electrical signal which is proportional to the amount of strain in the object being measured.

These units also feature a resistive balancing function which compensates for resistance variations of gauges and a calibration function which provides resistance variation corresponding to $\pm 1000 \times 10^{-6}$ strain in an active gauge.

This calibration function is suitable for use with 120Ω and 350Ω gauges.

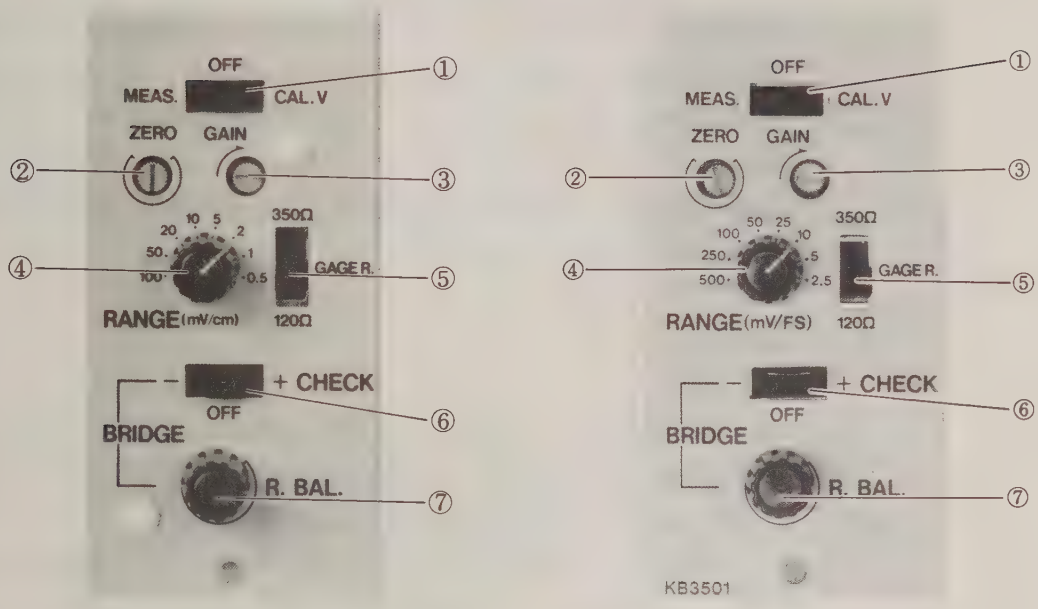
3V output is available for use as the excitation voltage for DC bridges.

* The DC bridge amplifier input terminals are different than the normal 3-pin terminals. Please indicate this when ordering DC bridge units.

7.2 Specifications

Model	KB3101	KB3102	KB3501
Input type	Floating ground with guard		
Measurement range	0.5, 1, 2, 5, 10, 20, 50, 100mV/cm	0.25, 0.5, 1, 2.5, 5, 10, 25, 50mV/cm	2.5, 5, 10, 25, 50, 100, 250, 500mV/fs
Active strain gauge	100 $\times 10^{-6}$ to 20,000 $\times 10^{-6}$ strain/cm	50 $\times 10^{-6}$ to 10,000 $\times 10^{-6}$ strain/cm	500 $\times 10^{-6}$ to 100,000 $\times 10^{-6}$ strain/fs
Accuracy	$\pm$1% of full scale (including linearity and deadband)		
Input resistance	200kΩ (fixed)		
Sensitivity adjustment	Continuous adjustment between ranges.		
Calibration voltage	Switchable voltage 2 times measurement range	Switchable voltage 4 times measurement range	Switchable voltage 1/2 times measurement range
Zero setting	Settable to any position with respect to full scale		
Frequency response	DC to 300Hz (-3dB points of amplifier alone)		
Excitation voltage	3V DC $\pm$0.5%		
Balance control	Resistive balance $\pm$0.5%		
Shunt calibration	+/OFF/- Switch is used to apply a resistance to one leg of the bridge corresponding to 1000×10^{-6} strain (suitable for 120Ω and 350Ω bridges).		
CMRR	100dB (DC), 80dB (50/60Hz)		
Maximum allowable input voltage	12V DC (p-p)		
Stability	5μV/°C (typical)		

7.3 Panel Description and Operation



1 MEAS./OFF/CAL.V

When this input switch is set to MEAS., the input signal is applied, and when set to OFF, the input signal is separated from the input and the input of the unit grounded. In the CAL.V position, a calibration voltage equal to 2 times (KB3101) or 4 times (KB3102) the measurement range is applied internally.

2 ZERO

This control is used to adjust the pen zero point.

This zero point adjustment is made with the MEAS./OFF/CAL.V switch in the OFF position.

3 GAIN

This continuous sensitivity control, when turned fully clockwise, results in the sensitivity indicated by the RANGE switch being set. The sensitivity is decreased by turning this control in the counterclockwise direction. It is adjusted to provide an easy reading of strain value, depending upon the number of gauges used.

4 RANGE

This sensitivity selection switch enables the selection of sensitivity in 8 steps in the range 0.5mV to 100mV/cm (KB3101) or 2.5mV to 500mV/fs (KB3501).

The set sensitivity may be varied by using the GAIN control.

5 GAUGE.R

This switch is set to the resistance of the gauge used, either 350Ω or 120Ω.

6 CHECK

This switch is used to apply a resistance change to one leg of the bridge equivalent to 1000×10^{-6} strain. This is used for calibration purposes.

This calibration function is used with the GAUGE.R switch set to either 120Ω or 350Ω, depending upon the type of gauge used.

For 120Ω gauges, 60.4kΩ is connected and for 350Ω gauges, 174kΩ is connected, the resulting strain being equivalent to 1000×10^{-6} strain (i.e., a bridge output of 1.5mV).

Polarity switching of +/- is possible, enabling calibration for both expansion and compression. This switch is placed in the OFF position during measurements.

7 R. BAL.

This control is used to compensate for the initial imbalance caused by variations between the gauge and dummy resistances making up the bridge.

(Operation)

(1) Connect the gauge to the input terminals. (Refer to the examples of bridge configurations and output voltages.)

(2) Set the MEAS./OFF/CAL.V to OFF.

(3) Use the ZERO adjustment to set the pen position.

(4) Set the RANGE switch to the desired measurement range.

(5) With the MEAS./OFF/CAL.V switch set to CAL.V, turn the GAIN control to adjust the pen amplitude. Turn the GAIN control counterclockwise to decrease the amplitude and clockwise to increase the amplitude. With the GAIN control in the extreme clockwise position, the sensitivity is the setting of the RANGE switch.

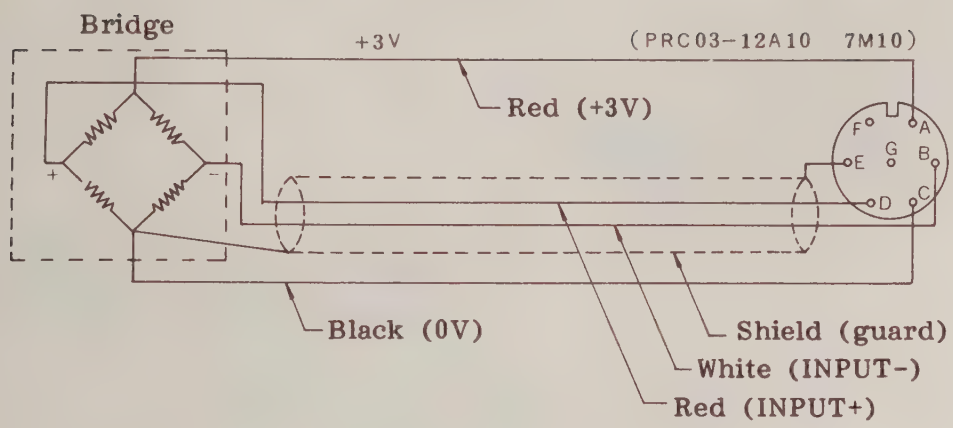
(6) Set the GAUGE.R switch to either 120Ω or 350Ω, depending upon which type of gauge is being used.

(7) Set the MEAS./OFF/CAL.V to MEAS. and the CHECK switch to either the + or -. Depending upon the bridge configuration, the appropriate calibration voltages will be input.

Adjust the R. BAL control to compensate for initial imbalance.

(8) Set the CHECK switch to OFF and the MEAS./OFF/CAL.V to MEAS. to begin measurements.

7.4 Input Connections



Pin	Signal
A	+3V
B	INPUT-
C	0V
D	INPUT+
E	Guard
F	NC
G	NC

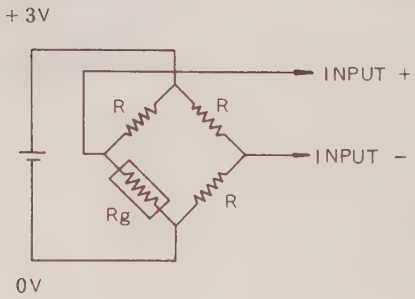
- To avoid induced noise, the outside shield should be connected to 0V at the bridge side.

7.5 Bridge Configuration and Output Voltage Examples (For a Gauge Ratio of 2)

7.5.1 Single Gauge

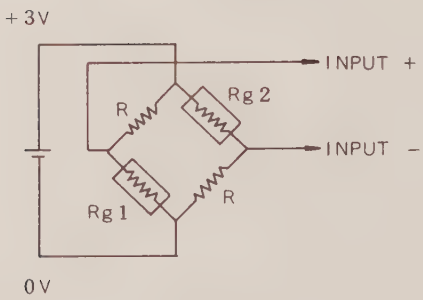
R_g: Gauge resistance
R: Fixed resistance

Strain	Output voltage
$1000x10^{-6}$	1.5mV



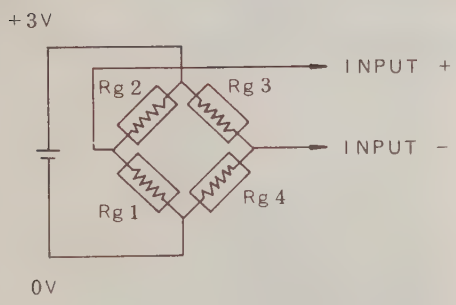
7.5.2 Two Gauges (With R_g1 and R_g2 resistance changes in the same direction)

Strain	Output voltage
$1000x10^{-6}$	3mV



7.5.3 Four Gauges (Resistance changes R_g1 & R_g3 and resistances R_g2 & R_g4 in the same direction, with R_g1 & R_g2 and R_g3 & R_g4 in the reverse direction)

Strain	Output voltage
$1000x10^{-6}$	6mV



8. F-V UNIT

8.1 Introduction

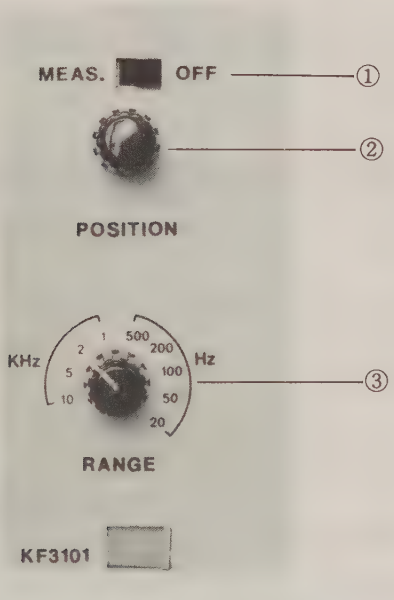
This frequency measuring unit accepts a pulse signal as its input.

In addition to frequency measurement, it is usable in a wide variety of applications, including rpm and vibration measurements.

8.2 Specifications

Model	KF3101
Input type	0.5V p-p or greater AC
Maximum sensitivity	20Hz/FS
Measurement range	20, 50, 100, 200, 500Hz/FS 1, 2, 5, 10kHz/FS
Input resistance	100kΩ (fixed)
Calibration reference	10kHz
Zero setting	Settable up to 50% of full scale
Linearity	±0.5%/FS
Ripple	1.5% (20Hz)
Response time	0.6s/FS
Maximum allowable input	200V p-p

8.3 Panel Description and Operation



1 MEAS./OFF

When this input switch is set to MEAS., the input signal is applied and when set to OFF, the input signal is separated from the input and the input of the unit grounded.

2 POSITION

This control is used to adjust the pen zero point.

This zero point adjustment is made with the MEAS./OFF switch in the OFF position.

3 RANGE

This sensitivity selection switch enables 9 steps of sensitivity to be selected in the range 20Hz to 10kHz/FS.

8.3.1 Operation

(1) Set the MEAS./OFF switch to OFF.

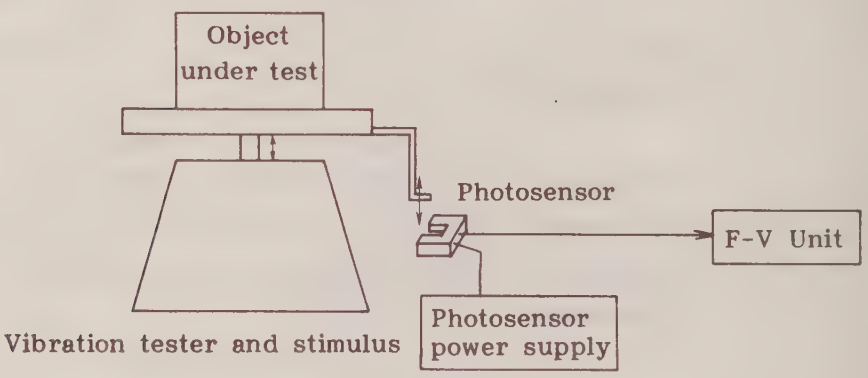
(2) Turn the POSITION control to set the pen position to the left edge.

(3) Set the RANGE switch to the desired measurement range.

(4) Set the MEAS./OFF switch to MEAS. to begin measurement.

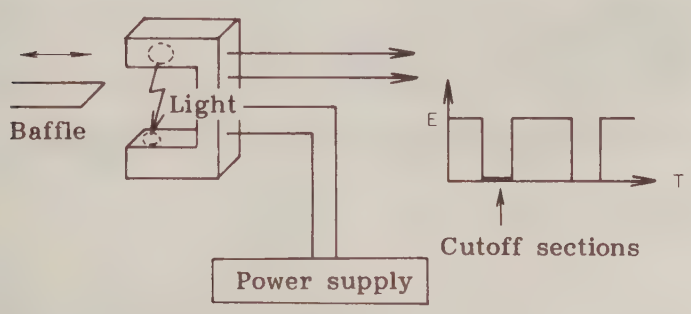
8.3.2 Application Examples

(1) Vibration Measurement



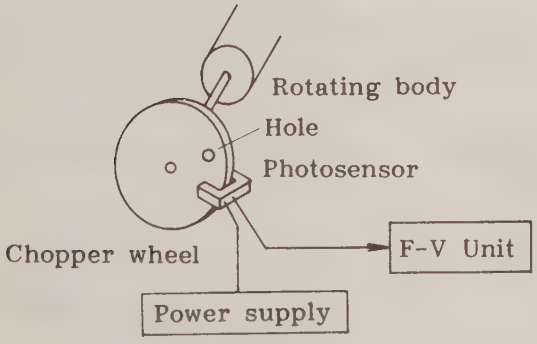
When using vibration testers and accelerator sources to perform vibration tests, the vibration frequency can be converted to a pulse signal using a photosensor or other device to enable direct recording.

The photosensor consists of a light-emitting and light-receiving element pair. The alternate impinging and blockage of light from the light receiver results in a pulse signal output.



(2) Rpm Measurement

A chopper with a hole is mounted onto the rotating body to be measured to enable measurement of rpm. With a single hole in the chopper wheel, the rotating speed will be in units of rps (revolutions per second). If a wheel with 60 holes is used, the units become rpm (revolutions per minute).



9. HIGH-VOLTAGE ISOLATION AMPLIFIER

9.1 Introduction

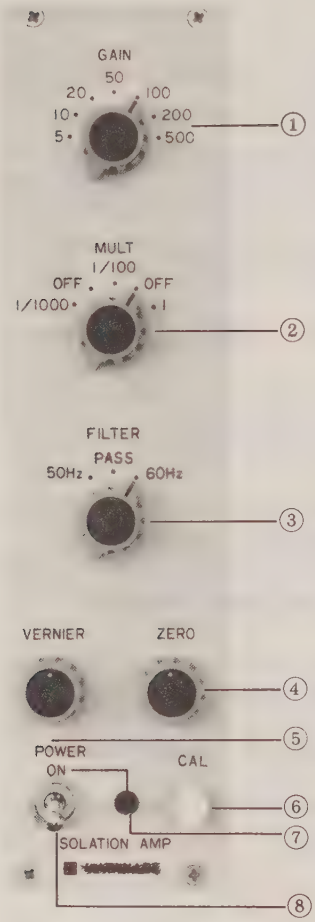
This amplifier provides high-voltage isolation and ensures safety in recording. In addition to enabling safe use of a linearcorder in measuring high voltage in such applications as steel production lines, it may be used with other recorders to provide high-voltage isolation and amplification.

9.2 Specifications

Model	KI3101
Input type	Floating
Input resistance	1MΩ (fixed)
Gain	x1/1000, 1/100, 1, 5, 10, 20, 50, 100, 200, 500
Accuracy	±1%
Frequency accuracy	+5%, -10% DC ∿ 2kHz, output of 10V p-p
Lowpass filter	5, 10, 20, 50, 100, 200, 1kHz, 2kHz (8 steps), -18dB/octave rolloff
Voltage measurement range	1mV ∿ 800V p-p (AC or DC)
Maximum allowable input voltage	±800V (DC or AC peak value)
CMRR	80dB (AC or DC)
Stability	20μV/°C, 200μV/10H ±200μV/ 100V AC ±15%

Model	KI3101
Output voltage	±10V, 5mA
Linearity	±0.1%/FS
Noise	15μV p-p or less
Isolation	Power supply to case: 10MΩ or greater measured with a 1000V DC megohm meter
Withstanding voltage	Input to case: 2500V AC for 1 minute Input to case: 1500V AC for 1 minute
Operating environment	0 ∿ 45°C, 30 ∿ 85% RH
Power supply	100V AC ±10%
Input filter	OFF/-40dB (50/60Hz) switchable
Sensitivity adjustment	Continuous adjustment between ranges
Zero setting	±120% of output voltage
Expandability	Up to 6 channels of single units connectable
Outer dimensions	66 x 450 x 250mm

9.3 Panel Description



1 GAIN

Amplifier gain selection switch.

2 MULT

Gain multiplier selection switch. This switch is used in combination with the GAIN switch setting to determine the overall amplifier gain. In the OFF position, the input is switched off.

3 FILTER

50/60Hz bandpass filter switch. Used to eliminate induced noise from the power line.

4 ZERO

This control is used to set the amplifier zero point.

5 VERNIER

This is a continuous gain control.

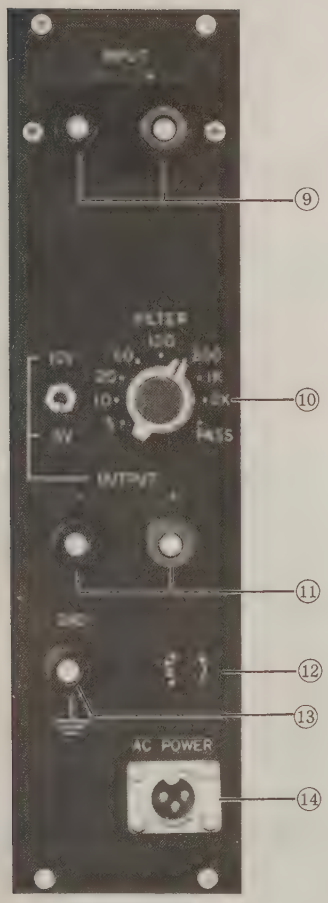
6 CAL

This switch outputs a calibration voltage. The gain is adjusted by pressing this switch and adjusting the VERNIER control.

7 Power Lamp

8 POWER

This is the amplifier power on/off switch.



9 INPUT

Input terminals.

10 FILTER

This switch selects the lowpass filter cutoff frequency.

11 OUTPUT

Output terminals.

12 FUSE

Fuse holder. A 0.5A fuse is used.

13 GND

Ground terminal. This terminal is internally connected to the case.

14 AC POWER

Power connector.

9.4 Operation

(1) Start Up

Plug in the power connector and set the POWER switch to ON.

(2) Signal Connections

Make signal connections to the rear panel input terminals and output terminals.

(3) Gain Setting

Use the GAIN switch and MULT switch to set the desired gain.

(4) Gain Calibration

Press the CAL switch and adjust the VERNIER control so that the output varies 10V. In this condition, the actual gain is that which is indicated on the panel.

(5) Filter

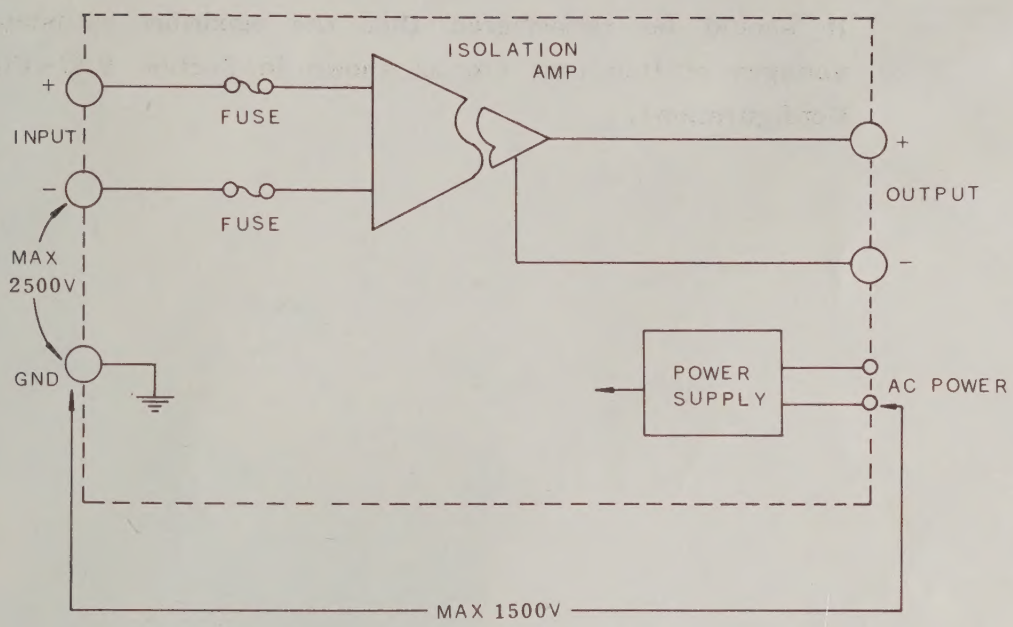
Induced noise from the power line may be eliminated by using the FILTER switch on the front panel.

The rear panel FILTER switch is used to insert a -18dB/octave rolloff lowpass filter.

(6) Zero Point Adjustment

Set the MULT switch to OFF and turn the ZERO control to adjust the amplifier zero point.

9.5 Circuit Configuration



9.6 Precautions for Measurements

9.6.1 Maximum Allowable Input Voltage

The maximum allowable input voltage will differ, depending upon the MULT switch setting.

MULT	Maximum allowable input voltage
1	10V
1/100	1000V
1/1000	1500V

9.6.2 Withstanding Voltage

It should be remembered that the maximum withstanding voltages of this unit are as shown in Section 9.5 (Circuit Configuration).

PLEASE NOTE
FAILURE TO RETURN THIS MANUAL WILL RESULT IN A MINIMUM BILLING CHARGE OF **$50.00.**

PLEASE INCLUDE MANUAL AND ACCESSORIES WHEN RETURNING EQUIPMENT

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Part No. 031119010

Printed in Japan